Journal of Data Acquisition and Processing
ISSN: 1004-9037
https://sjcjycl.cn/
DOI: 10.5281/zenodo.778213

AN IMPROVED ARTIFICIAL INTELLIGENCE MACHINE LEARNING FRAMEWORK TO HANDLE HEALTHCARE APPLICATIONS

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Abstract:
Healthcare is critical to living a happy life. However, itis quite difficult to secure a doctor's consultation for every health issue. This chatbot may be used by regular humans in any sort of emergency case, where it can advise people on primary care before seeing a doctor, or it can sometimes work as a doctor for small and short- term health issues such as a cold, headache, and so on. Along with this chatbot, there will be assistance for those in need who seek immediate solutions The original intent of chatbots was purely for human entertainment. Providing high-quality, cost-effective healthcare to India's expanding population is one of the country's top priorities right now, but it faces significant obstacles. In general, it must be able to understand what the user is trying to do and act accordingly. An array of new features has greatly expanded chatbots' informal skills up to this point. In their research, they provide a method for creating a chatbot using a deep neural network. A multi-layered neural network is used to learn from and analyse the data. The uniqueness of the predicted model lies in the fact that the bots may be trained on any computer file that supports the user's goals and demands. The integration of text-to-speech conversion increases the product's user-friendliness significantly.
Keywords: Chatbot, Health Care, Deep neural network

1.0 INTRODUCTION

Today, the healthcare sector is one of the world's most important focus areas. Individuals are becoming more vulnerable to lifestyle diseases. Many individuals are working on artificial human brains that can think and respond like humans A chatbot is a simple example of this technology. As we all know, computers currently assist people in every manner **[1].** Artificial intelligence has been developed in computer technology to improve systems in a variety of ways Computers provide us with information, engage us, and assist us in a variety of ways. A chatbot is a programme designed to mimic intelligent dialogue via text or speech. Nonetheless this work focuses solely on text Today, the healthcare industry is one of the world's most important emphasis areas Individuals are growing more vulnerable to lifestyle disorders. Many individuals are working on artificial human brains that can think and respond like humans A chatbot is a simple example of this technology **[2].** A chatbot is a programme designed to facilitate text-based conversation between humans and machines It's software that uses NLP to assist individuals have coherent conversations in multiple languages. Health bots are computer programs that mimic conversation with users using text or spoken language The advent of such technology has created a novel way to improve person-centered healthcare **[3].** The underlying technology that supports such health bots may include a set of rule-based algorithms, or employ

machine learning techniques such as natural language processing (NLP) to automate some portions of the conversation

Chatbot:

A Chatbot is a computer program uses AI that simulates human conversation through voice commands or text chats or both". There are a variety of Chatbot synonyms, including "talkbot," "bot," "IM bot," "interactive agent" or "artificial conversation entity", "conversational agents", "machine conversation systems", "dialogue systems", "digital assistants" and "virtual agents

Benefits of Chatbots in Healthcare

The advantages of using hybrid chatbots in healthcare are enormous – and all stakeholders share the benefits.

For once, medical chatbots reduce healthcare professionals' workload by reducing hospital visits, reducing unnecessary treatments and procedures, and decreasing hospital admissions and readmissions as treatment compliance and knowledge about their symptoms improve. For patients, this comes with a lot of benefits:

- less time spent commuting to the doctor's office
- less money spent on unnecessary treatments and tests
- easy access to the doctor at the push of a button

Research Gaps:

The chatbots used by the telecom and marketing sectors for customer service are scripted types of chatbots. They help the customers on some predefined customer care questions. Research is being carried out in making the conventional monotonous chatbots to be communicative, responsive and carry out the communication in a natural (conversational) language. This requires the inclusion of NLP and ML techniques in the system. There are a number of ways to do so. Selection of an appropriate method is based on the domain of the chatbot, the functionalities it intends to provide, the language of communication, the end user, etc. All the above-mentioned issues need to be considered while

Problem of the statement

AI healthcare chatbot is to provide patients with a convenient, accessible, and personalized way to access healthcare information and services. The chatbot uses natural language processing and machine learning algorithms to understand patient queries, provide accurate and relevant information. Additionally, the chatbot can help healthcare providers by automating routine tasks, such as appointment scheduling and patient triage, allowing them to focus on more complex and critical aspects of patient care. Overall, the objective of an AI healthcare chatbot is to improve healthcare accessibility, efficiency, and quality by leveraging the power of artificial intelligence to enhance the patient experience and streamline healthcare delivery

2.0 Literature review

This study aimed to review the recent literature on AI chatbots related to healthcare, identify and describe their applications for fighting the coronavirus, and investigating the design features of these chatbots. **Srivastava et al. [4]** The aim is to build a chatbot that engages patients and explains their condition with the help of natural language. The system is based on conversational data that the user provides while interacting with the chatbot. The idea behind this is to focus on the symptoms and problems the user is facing. After having an initial

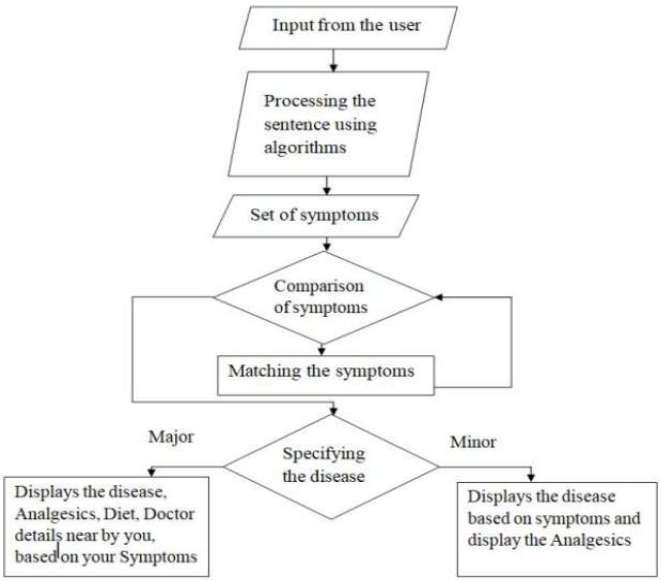
interaction with the user, the chatbot takes the conversation forward by asking the user questions and converting the input data into questions to attempt to review the diseases and execute them to gather the solution to the disease that the user Then the chatbot starts asking the user how the user is feeling. Once the chatbot gets enough data it detects the most likely disease that the user might be suffering from as per the input data. **Divyaet al. [5]** in proposed system symptom mapping is done. Where it identifies the symptoms of the patient and then diagnosis whether it's a major or minor disease, if it's major one then proper doctor will be referred to the patient. Doctor details will be extracted from database. One more thing, the user will be identified by the login details which is stored in the database. **Dev Vishal et al. [6]** aims to build a medical chatbot with the help of Google API for voice to text conversion and vice versa. In proposed system, the Chatbot API sends question to chatbot and obtain connected answer and after getting answer refer this answer analysis thereon and show answer on humanoid app. Connected information like drugs name, drugs end details so on from drugs API. once user raise question to the theme, logic of the grievance is recognized by applying information processing. **Gopi et al. [7]** proposed a chatbot which handles user requests and identify message patterns using artificial intelligence markup language. AIML is an XML-based markup dialect which is used to create natural language software agents and which gives the real human interactive experience to users. With the help of user responses and depending on them AIML logic retrieves symptomatic keywords to assess the existing user medical conditions. **Himanimittalet al. [8]** proposed The Health-Care Chat Bot System using Python and run Google conversation platform Google Dialogue flow, GUI hyperlinks and a easy, reachable community API. The machine should offer a possible parallel operation and the machine layout should no longer introduce scalability problems with respect to the amount of floor computers, drugs or presentations available at any given time. To build a chatbot using python Ghare Shifaet **al. [9**] proposes to build a chatbot using python to get a clear idea of its basics and about NLP. The basic vocabulary applied to chatbots is the bot's intentions, institutions, and pronunciation training and the bot's confidence score. In the field of Artificial Intelligence which helps the computer to recognize and analyze human language and to apply NLP we must understand Natural Language Understanding. NPL processes the raw data for which it is supposed to be a chatbot brain, which cleans it and takes appropriate action. **Dharwadkar [10]** classifies the test image into the class with the highest distance to the neighboring point in training. The SVM training algorithm builds a model that predicts whether the test image falls into this class or another. SVM requires a huge training data to set the decision boundary and the computing cost is very high.

Table: A Summary of Literature Review

Authors	Problem discussed and solved	Method/ Algorithm/ Tools Used	Results
Tao Jiang et al [11]	To implement word segmentation (tokenization)	Using Conditional Random Fields	This algorithm proves to be more accurate and less complex than the first but less efficient

			as compared to NLTK.
Jerome R. Bellagarda [12]	To implement POS Tagging	Using the latent analogy algorithm	Requires training of large amount of data. Hence involves complexity.
Liner Yang et al [13]	To implement POS Tagging	Using neural network algorithm	As the algorithm works in layers, it provides high accuracy, but is not time efficient.
Bo Chen et al. [14]	To create a dependency parser	Using a dependency tree to understand the dependencies.	Traditional method. Accuracy depends on the training of the data.
Zhenghua Li et al [15]	To create a dependency parser	Using a graph data structure for the implementation of the parser	Improvised version of the above-mentioned algorithm. Provides higher visibility, understandability and improves accuracy
Sijun Qin et al. [16]	Synonym detection and extraction	Feature selection method.by calculating feature polarity	Provides high accuracy and less complexity as compared to dictionary method

3.0 Proposed System



User validation and extraction of symptoms

In this step, we check if the user's login information is correct. Then, a string searching algorithm is used to the incoming natural language text in order to extract the symptoms by locating a substring reflecting the symptoms. “I have cough, fever, and nausea" is recognized by the system since the user specifically identified those symptoms. But the system must also be able to process data such as, "When I read, I'm good at first, but with time, my eyes appear to become fatigued, and I start to see double." Here, the algorithm has to pull out phrases like "eyes fatigued" and "see double" (but not "read" or "okay").

Mapping extracted symptoms with trained datasets

After analysing the user's input for a significant substring, we return a list of possible symptoms. The following step involves the user checking to see whether they match any of the symptoms listed. Their feedback helped us rule out a number of potential diseases. Finally, we map the symptoms to the particular illness and give further explanation and suggestions for symptoms by having users answer a series of questions.

Specifying the disease and referring a doctor

Symptoms entered into the system are compared to the medical conditions stored in the database. Going from one symptom to the next until a connection is found. The list of diseases gets whittled down based on user comments on the quality of the evaluation questions. The chatbot can identify and label the user's condition accurately. The severity of the identified illness is determined by comparing the chatbot's assessment to a set of established criteria. If the issue is particularly complex, the chatbot will recommend seeking human assistance.

4.0 METHODOLOGY

The main aim of a medical chatbot is to assist 24/7. They try to create a chatbot that can empathize with the patient and then proceed to give medical information by communicating in

the natural language. The chatbot initiates the conversation and moderates it. Some of the advanced forms can detect voice messages, facial expressions, and other movements.
Some of the medical chatbots used web-based text messaging applications where it delivered the sequence of how the conversation between a patient went. Another chatbot system gathered input and processed the data containing medical terminologies and provided the output solutions based on it.
This approach is based on a number of basic NLP techniques.

N-gram Algorithm

In the fields of computational linguistics and probability, an n-gram refers to a sequence of n consecutive items from a text or audio sample. The item being scanned might be a phoneme, a syllable, a letter, a word, or even a pair of base pairs. N-grams are often built from a massive corpus of text or audio. Word n-grams are also sometimes called "word shingles." A "unigram" refers to an n-gram of size 1, whereas a "bigram" (or, less commonly, a "di gram," from the Latin for "two") refers to a 2-gram, and a "trigram" refers to a 3-gram. Cardinal numbers in English are used in expressions like "four grams," "five grams," and so on. In computational biology, a polymer or oligomer of fixed size is called a k-mer rather than an n-gram. Names for k-mers often begin with either the Greek numerical prefixes (e.g., "monomer," "dimer," "trimer," "tetramer," "pentamer") or the English cardinal numbers (1-mer, 2-mer, 3-mer, etc.). N-Grams are one approach to teaching computers about the semantics of a word in context.
Example1: I am suffering from fever.
Example2: I am suffering from headache.
n=3(trigram)
example1:
(_I‘, _am‘, _suffering‘) ->I am suffering
(_am‘, _suffering‘, _from‘) ->I am suffering from
(_suffering‘, _from‘, _fever‘) ->I am suffering from fever
example2:
(_I‘, _am‘, _suffering‘) ->I am suffering
(_am‘, _suffering‘, _from‘) ->I am suffering from
(_suffering‘, _from‘, _headache‘) ->I am suffering from headache.

TF-IDF (Term Frequency-Inverse Data Frequency) algorithm

Let's pretend we need to rate the most appropriate English text document to the query "the brown cow." In order to narrow down the search, it is easiest to discard everything that doesn't include the phrases "the," "brown," and "cow." Nevertheless, this still leaves a large number of potential results. Counting how often each phrase appears in each document—its "term frequency"—could help us further differentiate between them. Adjustments, however, are frequently performed when the length of documents fluctuates substantially (see definition below). Each occurrence of a phrase in a document is given equal importance, regardless of how often that term appears.
Exmaple1: I am suffering from fever.

Example2: I am suffering from headache.

Tf = number of occurrences /number of words in document

Example1: Example2:

Tf(I)= 1/5=0.2 Tf(I)= 1/5=0.2

Tf(am)=1/5=0.2 Tf(am)=1/5=0.2

Tf(suffering)=1/5=0.2 Tf(suffering)=1/5=0.2

Tf(from)=1/5=0.2 Tf(from)=1/5=0.2

Tf(fever)=1/5=0.2 Tf(headache)=1/5=0.2

Due to its overuse, the preposition "the" will unfairly boost the importance of texts that use it more than the more pertinent "brown" and "cow" do. Unlike the less prevalent "brown" and "cow," the term "the" is not a helpful keyword to distinguish between related and unrelated texts and thoughts. We incorporate an inverse document frequency factor that gives more weight to less frequent words and lower weight to more frequent phrases.

Documents	**I**	**am**	**suffering**	**From**	**Fever**	**headache**
Document1	0.2*0=0	0.2*0=0	0.2*0=0	0.2*0=0	0.2*0.301= 0.012	**0**
Document2	0.2*0=0	0.2*0=0	0.2*0=0	0.2*0=0	**0**	0.2*0.301= 0.012

4.0 RESULTS AND DISCUSSIONS

	Disease	Symptoms
1	Allergy	nasal congestion, itchy and watery eyes, sneezing, stuffy or runny nose, scratchy or sore throat, throat clearing, cough from postnasal drip.
2	aneamia	Feel tired or lightheaded (sometimes with fainting) Weakness Fatigue easily Have decreased energy Appear pale Develop palpitations or rapid heart rate Experience shortness of breath
3	cold/flu	Headaches, body aches, fever, and flu-like symptoms Nasal congestion, runny nose, and sneezing Cough Sore throat
4	asthama	shortness of breath chest pain cough
5	alzheimers	loss of orientation (to person, place, or time), agitation, irritability, quarrelsomeness, and a diminishing ability to care for him- or herself and to dress
6	pregnancy	absence of menstrual periods breast swelling and tenderness. Food cravings
7	hyperthyroid	a rapid heart rate, excessive sweating, intolerance to heat, tremor, nervousness, or agitation. Other symptoms can include fatigue, weight loss, hair loss, increased appet
8	hypothyroid	fatigue, depression, mild weight gain, cold intolerance, sleepiness, constipation dry and coarse hair, dry skin, and muscle cramps. Blood cholesterol levels may be elevat
9	diabetes	dehydration, hunger, increased urination, and increased thirst.
10	HIV AIDS	fever, swollen lymph nodes, joint and muscle aches, and sore throat. chills, night sweats, and mouth ulcers.
11	high blood pressure	dizziness, shortness of breath, headache, and blurred vision nosebleeds, blood in the urine, fatigue, chest pain,
12	Rheumatoid Arthritis	aches stiffness, muscle aches, low-grade fever, fatigue, lack of appetite, loss of energy . Joints can become warm, swollen, reddened, painful,
13	hepatitis B	fatigue, loss of appetite, nausea, jaundice (yellowing of the skin and eyes), and pain in the upper right abdomen (due to the inflamed

14	Dengue	headache, fever, exhaustion, severe muscle joint pain, swollen lymph nodes rash, fever, itchy rash,headache
15	Malaria	fever and chills, headaches, nausea and vomiting, and general weakness and body aches
16	Chicken Pox	general weakness, fever up to 102 F, and red spots that start on the same day or so as the fever
17	jaundice	Yellow discoloration of the skin, mucous membranes and the whites of the eyes Light-colored skin Poor feeding Lethargy/excessive sleepiness Changes in muscle tone (either listless or stiff with arching of the back)
18	Diarrhea	bowel movements are frequent watery. no signs of inflammation. cramping abdominal pain
19	cataract	decrease in clarity of vision, not fully correctable with glasses. loss of contrast sensitivity. Disturbing glare in light
20	pneumonia	fever, chills, cough, shortness of breath, and fatigue.
21	Urinary Retention	inability to urinate painful, urgent need to urinate pain or discomfort in the lower abdomen bloating of the lower abdomen
22	Insomnia	Waking up unrefreshed from lack of sleep Daytime sleepiness and fatigue Mood changes Poor concentration and attention Anxiety Headaches Lack of energy Increased errors and mistakes
23	coronavirus	Difficulty breathing or shortness of breath,heavy cough,Persistent pain or pressure in the chest

Accuracy of algorithm found based on responses generated by chatbot to total number of responses available for each tag and datasets (as shown above) is:

```
26/26 [==============================] - 0s 2ms/step - loss: 0.0570 - accuracy:
0.9922
Epoch 195/200
26/26 [==============================] - 0s 2ms/step - loss: 0.0150 - accuracy:
1.0000
Epoch 196/200
26/26 [==============================] - 0s 2ms/step - loss: 0.0500 - accuracy:
0.9922
Epoch 197/200
26/26 [==============================] - 0s 2ms/step - loss: 0.0232 - accuracy:
0.9922
Epoch 198/200
26/26 [==============================] - 0s 3ms/step - loss: 0.0538 - accuracy:
0.9766
Epoch 199/200
26/26 [==============================] - 0s 2ms/step - loss: 0.0190 - accuracy:
0.9922
Epoch 200/200
26/26 [==============================] - 0s 2ms/step - loss: 0.0476 - accuracy:
0.9922
```

Conclusions:

These Chatbots will become an integral part of our lives in the coming years. These Chatbots will be able to analyse information, make their own decisions and provide suggestions. The notion of auto-decision of Chatbots can scare many people. But we believe this will enable people to solve their issues/problems effectively and efficiently. Further research and interdisciplinary collaboration could advance this technology to dramatically improve the quality of care for patients, rebalance the workload for clinicians, and revolutionize the practice of medicine

Future scope:

With the increasing technologies in the field of AI, ML and implementation of chatbots in various fields there are many future modules that can be added to the current proposed chatbot. Medical counseling via Video call connecting direct to the Doctor. Making the Chatbot available in different languages using NLP platforms. Linking the bot to the maps application

for proper location of the hospital recommended. Making the Bot more user friendly and available and accessible in remote areas.

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